

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-245454

(43)Date of publication of application : 07.09.2001

(51)Int.Cl.

H02K 9/06  
H02K 3/24  
H02K 19/22

(21)Application number : 2000-053528

(71)Applicant : MITSUBISHI ELECTRIC CORP

(22)Date of filing : 29.02.2000

(72)Inventor : TONO KYOKO

ASAO YOSHITO

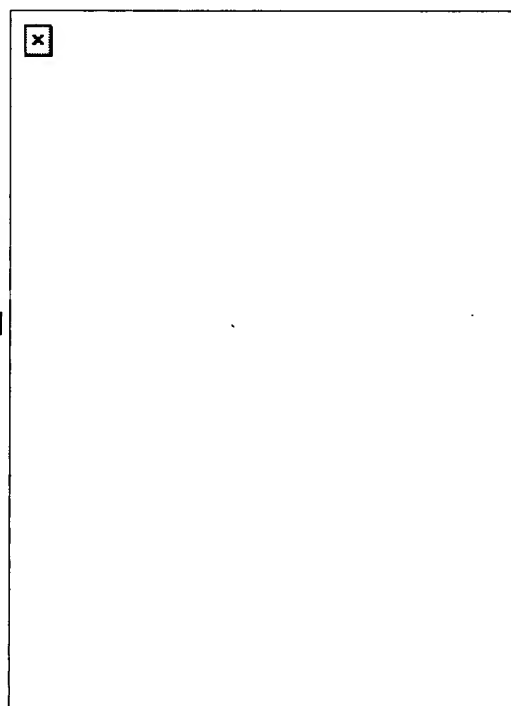
ADACHI KATSUMI

## (54) AC GENERATOR

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide an AC generator improving the cooling performance of its stator winding and reducing wind noise.

SOLUTION: The AC generator is constituted of a rotor 7 having nail-shaped magnetic poles 22, 23 fitted on the rotor shaft 6 and a cooling means 5 disposed on the sides of the nail-shaped magnetic poles 22, 23, a stator 8 having a stator core 15 disposed opposite to the rotor 7 and a stator winding 16 winding on the stator core 15 air-cooled by the cooling means 5, and brackets 1, 2 supporting the rotor 7 and the stator 8. Wind passages are provided in the bracket 1, 2 for wind blown by the cooling means 5. The stator winding 16 has coil ends 16a, 16b which project outwardly both ends of the stator core 15 and a shield material 101 is provided to cover at least the inner peripheral surface of coil ends 16a, 16b.



## LEGAL STATUS

[Date of request for examination]

18.12.2002

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the  
examiner's decision of rejection or application  
converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of  
rejection]

[Date of requesting appeal against examiner's  
decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

## \* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

## DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the stator structure of the AC generator especially carried in vehicles, such as a passenger car and a truck, about the AC generator driven with an internal combustion engine.

[0002]

[Description of the Prior Art] Drawing 15 is the perspective view showing the stator of the conventional AC generator. In the stator 208 of the conventional AC generator, resin 202 was formed so that a coil might cover the whole in the coil and the section which are the part exposed from a stator core 15, and the wind noise was reduced by smoothing the front face of the concavo-convex configuration by the aggregate of two or more coils. Namely, in the style of cooling, more, although the coil which is raised by the fan prepared in the rotator which is not illustrated in a coil and the section and generating heat was cooled, resin 202 was formed, it is smoothing a coil and a front face, and interference with a fan and a coil strand was reduced and the wind noise was reduced.

[0003]

[Problem(s) to be Solved by the Invention] However, in the conventional AC generator of such a configuration, since a coil and the whole were covered with resin 202, for the coil which is a heating element, it became a harsh environment and had had a big adverse effect on the output of an AC generator. Moreover, in shaping of resin 202, since the resin which created the wrap mold and made a coil and the whole section soft in the type of inside, for example was poured out, hardened and produced, machining nature was bad.

[0004] Moreover, if an AC generator was an AC generator of a three phase circuit, since three coil turn groups would overlap selectively in a coil and the section and they would not have aligned, while it is difficult to arrange the resin 202 prepared in a coil and the section on homogeneity over the perimeter, it became the configuration where it inclined toward shaft orientations and a hoop direction and cooling nature became an ununiformity, it had become the cause which causes aggravation of a wind noise.

[0005] It aims at obtaining the AC generator which can reduce a wind noise while this invention was made in order to solve the above technical problems, and it improves cooling nature of a stator winding.

[0006]

[Means for Solving the Problem] The rotator which has the cooling means formed in the pawl-like magnetic pole and pawl-like magnetic pole by which the AC generator concerning this invention is attached in a revolving shaft, In the AC generator which has the stator which has the stator winding around which the stator core and stator core by which opposite arrangement was carried out with the rotator were looped, and is cooled by the cooling means, and the bracket which supports a rotator and a stator The ventilation flue by the cooling means is prepared in bracket, a stator winding has the coil end which extends from the end face of a stator core to the method of outside, and even if there are few coil ends, the shielding material is formed so that inner skin may be covered.

[0007] Moreover, as for the shielding material, the hole is formed in the principal plane.

[0008] Moreover, as for the shielding material, irregularity is formed in the front face.

[0009] Moreover, the wrap shielding material has fixed the coil end with the 2nd thermally conductive good resin from a coil and the 1st resin which is alike and is already kicked.

[0010] Moreover, in the coil end of one [ at least ] edge of a stator, the turn section over the predetermined pitch

\*\*\*\*\* slot of a stator winding is formed in the hoop direction at the abbreviation same configuration.

[0011] moreover, the space between the turn sections which adjoin the hoop direction formed of the coil of one [ at least ] edge of a stator, and the turn section over [ it is alike, set and ] the predetermined pitch \*\*\*\*\* slot of a stator winding -- abbreviation -- it is formed identically.

[0012] Moreover, the cross-section configuration within the slot of the conductor of a stator winding is an abbreviation rectangle configuration where the slot configuration was met.

[0013] Furthermore, the cooling lee-side style side of a cooling means is adjoined, and at least one side of a coil end is allotted.

[0014]

[Embodiment of the Invention] Gestalt 1. drawing 1 of operation is the sectional view showing the configuration of the AC generator concerning the gestalt 1 of implementation of this invention. Drawing 2 is the perspective view showing the stator of this AC generator. Drawing 3 is the important section sectional view showing the stator of this AC generator. Drawing 4 and drawing 5 are drawings explaining the production process of the coil group which constitutes the stator winding applied to this AC generator. Drawing 6 is drawing showing the strand group by the side of the inner layer which constitutes the stator winding applied to this AC generator, and (b of (a) of drawing 6 ) of that side elevation and drawing 6 is that top view. Drawing 7 is the perspective view showing the important section of the strand which constitutes the stator winding applied to this AC generator. Drawing 8 is drawing explaining the array of the strand which constitutes the stator winding applied to this AC generator.

[0015] Moreover, drawing 9 is drawing explaining the structure of a stator core where this AC generator is applied, and (b of (a) of drawing 9 ) of that side elevation and drawing 9 is that rear view. Drawing 10 is a process sectional view explaining the production process of the stator to which this AC generator is applied. In addition, lead wire and passage connection are omitted in drawing 2 .

[0016] It sets to drawing 1 , and it is equipped with an AC generator free [ a revolution ] through a shaft 6 in the case 3 where the rotator 7 of the Randle mold consisted of the drive side bearing brackets 1 and commutator side bearing brackets 2 made from aluminum, and it fixes to the internal surface of a case 3, and it is constituted so that a stator 8 may cover the periphery side of a rotator 7.

[0017] The shaft 6 is supported by the drive side bearing bracket 1 and the commutator side bearing bracket 2 pivotable. A pulley 4 fixes at the end of this shaft 6, and engine running torque can be transmitted now to a shaft 6 through a belt (not shown). The slip ring 9 which supplies a current to a rotator 7 fixes to the other end of a shaft 6, and it is contained by the brush holder 11 arranged in the case 3 so that the brush 10 of a couple might \*\*\*\* to this slip ring 9. The heat sink 17 with which the regulator 18 which adjusts the magnitude of the alternating voltage produced in the stator 8 was attached in the brush holder 11 is pasted. It connects with a stator 8 electrically and is equipped with the rectifier 12 which rectifies the alternating current produced in the stator 8 to a direct current in the case 3.

[0018] A rotator 7 is formed so that the rotator coil 13 which passes a current and generates magnetic flux, and this rotator coil 13 may be covered, and it consists of field cores 20 and 21 of the couple in which a magnetic pole is formed of the magnetic flux generated with the rotator coil 13. The pawl-like magnetic poles 22 and 23 of eight pawl configurations protruded on the periphery edge by angular pitches [ hoop direction ], respectively, the field cores 20 and 21 of a couple are iron, they countered so that the pawl-like magnetic poles 22 and 23 might be engaged, and they have fixed at the shaft 6. Furthermore, the fan 5 as a cooling means has fixed to the ends of the shaft orientations of a rotator 7.

[0019] Moreover, the inhalation-of-air holes 1a and 2a are formed in the end face of the shaft orientations of a drive side bearing bracket 1 and a commutator side bearing bracket 2, and exhaust hole 1b and 2b are countered and prepared in the coil of the front-side of a stator winding 16, and a rear-side, and the direction outside of a path of Groups 16a and 16b at the periphery both-shoulders section of a drive side bearing bracket 1 and a commutator side bearing bracket 2.

[0020] The stator 8 is equipped with the insulator 19 with which a hoop direction is equipped with slot 15a prolonged in shaft orientations in each slot 15a with the stator core 15 which consists of the layer-built iron core of the shape of a cylinder by which two or more formation was carried out in the predetermined pitch, and the polyphase stator winding 16 as a coil coil around which the stator core 15 was looped, and the polyphase stator winding 16 and a stator core 15 are insulated electrically so that it may be notably shown in drawing 2 and

drawing 3 .

[0021] And it has two or more coils which the wave volume was carried out and were looped around so that one strand 30 might be turned up out of slot 15a by the side of the end face of a stator core 15 and the polyphase stator winding group 16 might take an inner layer and an outer layer by turns in the slot depth direction within slot 15a for every number of predetermined slots. Here, corresponding to the number of magnetic poles of a rotator 7 (16), 96 slot 15a is formed in the stator core 15 at equal intervals so that 2 sets of three-phase-circuit stator windings may be held. Moreover, the copper-wire material of the long picture which has the cross section of the rectangle by which pre-insulation was carried out, for example is used for a strand 30.

[0022] And the shielding material 101 is formed so that the inner skin of the coil which extends from the ends side of a stator core 15 to the method of outside, and Groups 16a and 16b may be covered. A shielding material 101 is produced in the shape of [ of 0.1mm thickness ] sheet metal with aluminum, and it is formed in the shape of an outline cylinder so that the pawl-like magnetic poles 22 and 23 may be countered. the height of the shaft orientations of a shielding material 101 -- a coil and Groups 16a and 16b, and abbreviation -- it is the same height. In addition, alumite processing is performed to the coil contact side of the shielding material 101 of aluminum for the insulation.

[0023] In processing of a coil end including installation of a shielding material 101, after an iron core 36 is rounded off and the cylinder-like iron core 37 is formed, a shielding material 101 is arranged so that this inner skin may be first covered to the inner skin of the coil which extends from the ends side of a stator core 15 to the method of outside, and Groups 16a and 16b. And it adheres to the epoxy resin 102 as the 1st resin in this condition, the crowning, i.e., the shaft-orientations edge, of a coil and Groups 16a and 16b. This epoxy resin 102 is made to adhere by dipping the crowning of a coil and Groups 16a and 16b in the immersion tub in which the dissolved epoxy resin was accumulated. While this epoxy resin 102 compensates exfoliation of the insulating coat of the strand 30 which curves in the turn section 30a crowning and raises insulation performance, it is made to adhere in order to fix one side of a shielding material 101. Moreover, the interference sound by the irregularity of the turn section is prevented by spreading of this epoxy resin 102.

[0024] Then, the varnish 103 as the 2nd resin is applied so that a coil and Groups 16a and 16b, a shielding material 101, and the whole epoxy resin 102 may be covered. A varnish 103 is dropped at a coil and a part, and a varnish 103 makes the cylinder-like iron core 37 permeate them, predetermined degree[ of angle ]-leaning and rotating a shaft horizontally, and is prepared. A varnish 103 raises the whole rigidity while permeating the very small clearance between a shielding material 101 and a strand 30, and between strand 30 and it raises a bonnet and insulation performance very thinly as for the whole front face. In addition, in drawing 3 , the shielding material 101, the epoxy resin 102, and the varnish 103 are actually formed very thinly respectively, although thickness etc. is greatly shown for explanation.

[0025] The varnish 103 prepared between a shielding material 101 and a strand 30 is formed very thinly, and a coil, and the Groups 16a and 16b and shielding material 101 of each other are fixed so that heat conduction may become good. On the other hand, a varnish 103 is good also as a configuration which cools the radiant heat of a coil and Groups 16a and 16b through a shielding material 101 through air selectively, if it does not necessarily need to be prepared in the whole surface and both insulation is carried out.

[0026] Next, although a process gets mixed up, it explains concretely, referring to drawing 4 thru/or drawing 10 about the assembly approach of a stator 8. First, as shown in drawing 4 , simultaneously, on the same flat surface, the strand 30 of 12 long pictures is bent in the shape of thunder, and is formed. Subsequently, as shown to drawing 5 by the arrow head, it folds up and dies with a fixture in the direction of a right angle, and strand group 35A shown in drawing 6 is produced. Furthermore, strand group 35B which has passage connection and lead wire and which is not illustrated is produced similarly. And in order to make easy to fabricate annularly the iron core 36 where it was equipped with the coil groups 35A and 35B, annealing treatment of the after coil groups 35A and 35B is carried out for 10 minutes at 300 degrees C.

[0027] In addition, each strand 30 is bent and formed in the plane pattern with which bay 30b connected by turn section 30a was arranged by six slot pitches (6P) as shown in drawing 7 . And adjacent bay 30b is shifted by turn section 30a by the width of face (W) of a strand 30. Two strands 30 formed in such a pattern are 6 slot-pitch \*\* carried out as shown in drawing 8 , the strand pair arranged in piles shifts one slot pitch bay 30b at a time, and six pairs of strand groups 35A and 35B are arranged, and are constituted. And the edge of a strand 30 has extended six [ at a time ] on both sides of the ends of the strand groups 35A and 35B. Moreover, turn

section 30a aligns in the both-sides section of the strand groups 35A and 35B, and is arranged.

[0028] Moreover, as slot 36a of a trapezoid configuration carries out the predetermined number-of-sheets laminating of the SPCC material formed in the predetermined pitch (it is 30 degrees at an electrical angle), carries out laser welding of the periphery section and is shown in drawing 9, the iron core 36 of a rectangular parallelepiped is produced.

[0029] And as shown in (a) of drawing 10, slot 36a of an iron core 36 is equipped with an insulator 19, and each bay of two strand groups 35A and 35B is pushed in piles into each slot 36a. Thereby, as shown in (b) of drawing 10, an iron core 36 is equipped with two strand groups 35A and 35B. At this time, it insulates with an iron core 36 with an insulator 19, and four bay 30b of a strand 30 is contained together with the direction of a path in slot 15a. Moreover, two strand groups 35A and 35B lap, and the iron core 36 is equipped with them.

[0030] Subsequently, an iron core 36 is rounded off, the end faces are made to contact and it welds, and as shown in (c) of drawing 10, the cylinder-like iron core 37 is acquired. By rounding off an iron core 36, slot 36a (equivalent to slot 15a of a stator core) becomes an abbreviation rectangle cross-section configuration, and the opening 36b (equivalent to opening 15b of slot 15a) becomes smaller than the slot-width direction dimension of bay 30b.

[0031] Thus, in the constituted AC generator, a current is supplied to the rotator coil 13 through a brush 10 and the slip ring 9 from a dc-battery (not shown), and magnetic flux is generated. The pawl-like magnetic pole 22 of one field core 20 is magnetized by N pole, and the pawl-like magnetic pole 23 of the field core 21 of another side is magnetized by this magnetic flux at the south pole. On the other hand, engine running torque is transmitted to a shaft 6 through a belt and a pulley 4, and a rotator 7 rotates. Then, rotating magnetic field are given to the polyphase stator winding 16, and electromotive force occurs in the polyphase stator winding 16. While the electromotive force of this alternating current is rectified by direct current through a rectifier 12, that magnitude is adjusted by the regulator 18 and charged by the dc-battery.

[0032] And it absorbs through inhalation-of-air hole which the open air countered heat sink 17 of heat sink [ of a rectifier 12 ], and regulator 18 by fan's 5 revolution in rear-side, respectively, and was prepared 2a, it flows in accordance with the shaft of a shaft 6, a rectifier 12 and a regulator 18 are cooled, it is bent by the fan 5 in the centrifugal direction after that, the coil of the rear-side of the polyphase stator winding 16 and group 16b are cooled, and it is discharged outside from exhaust hole 2b. On the other hand, in a front-side, the open air is inhaled by shaft orientations from inhalation-of-air hole 1a, is bent by the fan 5 in the centrifugal direction after that, cools the coil of the front-side of the polyphase stator winding 16, and group 16a, and is discharged outside by revolution of a fan 5 from exhaust hole 1b.

[0033] Since the field which counters a rotator 7 since according to the gestalt of this operation the shielding material 101 is formed so that the inner skin of a coil and Groups 16a and 16b may be covered becomes a flat, the collision of the cooling style can be eased and an interference sound and a wind noise can be made small.

[0034] Moreover, according to the gestalt of this operation, a varnish 103 is formed very thinly. therefore, if compared with the conventional example, a strand 30 will be exposed except the part covered with the shielding material 101 -- \*\*\*\* -- it is equal, therefore heat dissipation of the polyphase stator winding 16 is not barred, and the output of an AC generator is not reduced Here, it is not necessary to necessarily form a shielding material 101 in the ends of a stator coil and a group. It is effective, if it prepares only in the coil and group of an edge especially while there is much air capacity and a noise generating contribution is large.

[0035] Moreover, a coil and Groups 16a and 16b arrange turn section 30a to a hoop direction, and are constituted. thereby -- a conductor -- compared with the conventional coil and conventional group which have joined edge 54b of a segment 54, a coil and the extension height from the end face of the stator core 15 of a group can be made low. Thereby, the draft resistance in a coil and Groups 16a and 16b can become still smaller, and can reduce the wind noise resulting from the revolution of a rotator 7. Moreover, the leakage reactance of the coil of a coil end decreases and an output and effectiveness improve.

[0036] Moreover, four strands 30 are arranged in the direction of a path in slot 15a at one train, and turn section 30a is arranged together with two trains in the hoop direction. Since turn section 30a which constitutes a coil and Groups 16a and 16b is distributed by two trains in the direction of a path by this, respectively, a coil and the extension height from the end face of the stator core 15 of Groups 16a and 16b can be made low. Consequently, the draft resistance in a coil and Groups 16a and 16b can become small, and can reduce the wind noise resulting from the revolution of a rotator 7.

[0037] moreover, turn section 30a turned up by the end-face side of a stator core 15 -- 6 slot detached building - - \*\*\*\* -- two bays 30b arranged as a different layer in slot 15a is connected to a serial. Since high \*\*\*\*-ization of a stator winding is attained while the coil of each phase and interference of a between are suppressed, the thickness of the direction of a path of a coil end becomes small by this and formation also of the wearing tooth space of a shielding material 101 is attained, a high increase in power is realized.

[0038] Moreover, each turn section 30a can be easily formed in an abbreviation same configuration. And since the irregularity of the hoop direction in a coil and the shaft-orientations end face of Groups 16a and 16b can be stopped by forming each turn section 30a in an abbreviation same configuration, i.e., forming in an abbreviation same configuration turn section 30a which constitutes a coil and Groups 16a and 16b in a hoop direction, the wind noise generated between a rotator 7, a coil, and Groups 16a and 16b can be reduced. Moreover, leakage inductance becomes equal and the stable output is obtained. Furthermore, since the coil end has aligned, it is suitable for sticking a shielding material 101.

[0039] Moreover, since turn section 30a estranges to a hoop direction and the space between turn section 30a is formed in the hoop direction at abbreviation identitas, while being able to stop the irregularity of the hoop direction in a coil and the shaft-orientations edge of Groups 16a and 16b and raising cooling nature in the coil by the side of a periphery, the noise according to interference with a coil end as the style of cooling is reduced.

[0040] Moreover, since each turn section 30a is formed in an abbreviation same configuration, aligns in a hoop direction and is arranged, the heat dissipation nature in each turn section 30a becomes equivalent, and the heat dissipation nature in a coil and Groups 16a and 16b becomes still more equivalent. Thereby, generation of heat by the polyphase stator winding 16 will radiate heat uniformly from each turn section 30a, and will radiate heat uniformly from both coils and Groups 16a and 16b further, and heat conduction to a shielding material 101 is also made by homogeneity, and cooling nature's of the polyphase stator winding 16 improves.

[0041] Moreover, since the opening dimension of opening 15b of slot 15a is constituted smaller than the slot-width direction dimension of a strand 30, while the elutriation of the strand 30 from slot 15a to the direction inside of a path is prevented, an interference sound with the rotator 7 in opening 15b is also reduced.

[0042] Moreover, since bay 30b is formed in the rectangular section, when bay 30b is held in slot 15a, the cross-section configuration of bay 30b is the configuration where the slot configuration was met. While it becomes easy to raise the space factor of the strand 30 in slot 15a by this, the heat transfer from a strand 30 to a stator core 15 can be raised. Here, although bay 30b shall be formed in the rectangular section with the gestalt 1 of this operation, the cross-section configuration of bay 30b should just be an abbreviation rectangle cross-section configuration where the slot configuration of an abbreviation rectangle cross section was met. This abbreviation rectangle configuration may be not only a rectangle but a square, the configuration which consisted of a flat surface of four sides, and a round angle, the ellipse which made the rectangular shorter side radii.

[0043] Moreover, since the strand 30 is formed in the rectangular cross-section configuration, the heat sinking plane product from turn section 30b which constitutes a coil end becomes large, and generation of heat of the polyphase stator winding 16 radiates heat effectively. Furthermore, by arranging the long side of the rectangular section to the direction of a path, and parallel, can secure the clearance between turn section 30b, enable ventilation of the cooling style by the side of the periphery in coil and group 16a and 16b, and cooling nature improves. Moreover, since the front face of a coil and Groups 16a and 16b can constitute for a flat, the adhesive property of a shielding material 101 improves.

[0044] Moreover, the stator 8 by the gestalt 1 of this operation inserts in slot 36a of the iron core 36 of a rectangular parallelepiped the strand group 35 which consists of a successive line from opening 36b, after that, can round off an iron core 36 annularly, and can produce it. Then, since the opening dimension of opening 36b of an iron core 36 can be made larger than the slot-width direction dimension of a strand 30, the insertion workability of the strand group 35 can be raised. Moreover, since the opening dimension of opening 36b can be made smaller than the slot-width direction dimension of a strand 30 by fabricating an iron core 36 annularly, a space factor is raised and an output can be raised. Moreover, thereby, the wind noise reduction by the rotator is also made. Furthermore, the productivity of a stator is not reduced even if the number of slots increases.

[0045] Moreover, a coil and Groups 16a and 16b have low height, and since there are also few joints, the interference sound between the cooling wind, coil, and Groups 16a and 16b which were formed by the fan 5 of the revolution of a rotator 7 is small [ Groups ]. Moreover, since there are few joints, insulation with the metaled shielding material 101 is not checked like the gestalt of this operation. The configuration of both coils



and Groups 16a and 16b spreads abbreviation etc., and since the fan 5 is formed in the both ends of a rotator 7, both coils and Groups 16a and 16b are cooled with sufficient balance, and stator winding temperature is reduced uniformly and greatly.

[0046] Here, a fan 5 does not necessarily need to prepare in the ends of a rotator 7, and should just prepare in consideration of the arrangement location of a stator winding or a rectifier which is a big heating element. For example, it is good to arrange a fan in the edge of a near rotator at which the coil end of the stator winding which is the greatest heating element is arranged to the discharge side of a fan with a large cooling rate, and the rectifier is arranged. Moreover, since a pulley is usually connected with a crankshaft through a belt when attached in a car engine, it is good to arrange a fan in an anti-pulley side so that a fan's cooling drainage wind may not influence a belt. In addition, since the mold section of the pawl-like magnetic poles 22 and 23 of a rotator 7 also has an air blasting operation and can be used as a cooling means, even if there is no fan, the effectiveness of this invention can be acquired.

[0047] Moreover, since the shaft-orientations die length of the stator 8 containing a coil end is smaller than the shaft-orientations die length of field cores 20 and 21, a miniaturization is realizable. Moreover, while a draft resistance becomes remarkably small and a wind noise is reduced since there is no coil end in a fan discharge side when the fan 5 is formed in the both ends of a rotator 7, the temperature rise of the object with built-in cooling of rectifier 12 grade can be suppressed.

[0048] In addition, although the shielding material 101 has fixed the epoxy resin 102 prepared in the crowning of a coil and Groups 16a and 16b, a coil, and the whole section with the wrap varnish 103 in processing of a coil end including installation of a shielding material 101 with the gestalt 1 of this operation, about the approach of immobilization of a shielding material 101, it is not limited to this. For example, you may fix only with thermally conductive good adhesives, and several places may be closed and fixed to a hoop direction by two or more metal holddown members. That is, in the fixed approach of a shielding material 101, if it is not limited to the gestalt of this operation and a shielding material 101 is fixed to the inner skin of a coil and Groups 16a and 16b by a certain approach, effectiveness can be acquired.

[0049] Moreover, although the varnish 103 is used for final fixing of a shielding material 101 with the gestalt of this operation, it is desirable to fix with a thermally conductive good ingredient about the ingredient which fixes. By using such an ingredient, heat can be transmitted to a shielding material 101 good from the polyphase stator winding 16, and heat can be effectively radiated in generation of heat of the polyphase stator winding 16.

[0050] Furthermore, in the gestalt of this operation, the shielding material 101 formed so that the inner skin of a coil and Groups 16a and 16b might be covered is produced with aluminum. The ingredient of a shielding material 101 is however, not only like aluminum but like stainless steel, nylon, and the adhesive tape of a thin film. Since it is exposed to an elevated temperature 200 degrees C or more, especially the stator of the AC generator for cars can obtain the stator which was excellent in heatproof, if polyimide resin and a liquid crystal polymer are used, when using resin material as an ingredient of a shielding material 101.

[0051] Furthermore, in the gestalt of this operation, although a stator winding is looped around so that the long strand 30 may be turned up depending on the method of the outside of slot 15a and may take a inner layer and an outer layer by turns in the depth direction of slot 15a for every number of predetermined slots like above-mentioned explanation, it is not limited to this. That is, the short coil piece of two or more letters of the abbreviation for U characters may be inserted from the shaft-orientations end side of a stator core 15, coil one end which made stator-core 15 axis end project may be connected for every predetermined coil piece, and a continuation circuit may be constituted.

[0052] Gestalt 2. drawing 11 of operation is the perspective view showing the stator of the AC generator concerning the gestalt 2 of implementation of this invention. Drawing 12 is the important section sectional view of a stator. In the gestalt of this operation, the shielding material 111 is formed not only in the inner skin of a coil and Groups 16a and 16b but in the peripheral face. And two or more hole 111a is punched further at the shielding material 111. Since a varnish 103 permeates hole 111a, a coil, and Groups 16a and 16b and a shielding material 111 fix firmly.

[0053] In the gestalt of this operation, the shielding material 111 is formed so that a coil, and the inner skin and the peripheral face of Groups 16a and 16b may be covered. Therefore, the collision of the cooling style can be smoothed further and an interference sound and a wind noise can be made small. Moreover, it fixes firmly while refrigeration capacity of a shielding material 111 improves, since hole 111a is formed in the principal plane.



Moreover, the epoxy resin 102 is applied to the crowning of a coil end, and the interference sound by the irregularity of a shaft-orientations edge can be prevented like the gestalt 1 of operation.

[0054] In addition, although hole 111a of the gestalt of this operation is circular, the shape of the shape of a polygon or a mesh has as a hole, and there is no definition in a configuration.

[0055] In the gestalt of gestalt 3. book implementation of operation, a shielding material 121 has irregularity on a front face. Although this irregularity may be prepared only in one side, in preparing in both sides, when both immobilization becomes [ a sticking tendency with a coil and Groups 16a and 16b ] good certainly and the hitting area of the cooling style increases, refrigeration capacity improves.

[0056] When equipping the inner circumference of a coil and Groups 16a and 16b with a shielding material 121 like the gestalt of this operation, there is almost no tooth space between the inner circumference of a coil and Groups 16a and 16b, and the periphery of a rotator 7, and above-mentioned irregularity is formed in it very small with about 0.2mm. Therefore, most aggravation of a wind noise is not seen about the cooling wind which crosses the front face of a shielding material 121. Moreover, if surface roughness increases, effectiveness can be acquired, and there is no definition about the concavo-convex configuration prepared in a front face.

[0057] Gestalt 4. drawing 13 of operation is the perspective view showing the stator of the AC generator concerning the gestalt 4 of implementation of this invention. Drawing 14 is the important section sectional view of a stator. The shielding material 131 of the gestalt of this operation is prolonged from the upper bed of wrap flat part 131a and flat part 131a in the rotator 7 of a coil and Groups 16a and 16b, and the inner skin which counters, and the sectional view of drawing 14 consists a coil and the shaft-orientations edge of Groups 16a and 16b of wrap bend 131b, as is shown notably.

[0058] In the gestalt of this operation, since the shielding material 131 is formed so that the rotator 7 of a coil and Groups 16a and 16b and from the inner skin which counters to a shaft-orientations edge may be covered, the collision of the cooling style can be smoothed further and an interference sound and a wind noise can be made still smaller.

[0059] Since the shielding material 131 is formed to the crowning of a coil and a group unlike the gestalt of above-mentioned operation, even if the gestalt of this operation abolishes an epoxy resin, it can control further generating of the interference sound by the irregularity of a coil and a shaft-orientations edge.

[0060]

[Effect of the Invention] The rotator which has the cooling means formed in the pawl-like magnetic pole and pawl-like magnetic pole by which the AC generator concerning this invention is attached in a revolving shaft, In the AC generator which has the stator which has the stator winding around which the stator core and stator core by which opposite arrangement was carried out with the rotator were looped, and is cooled by the cooling means, and the bracket which supports a rotator and a stator The ventilation flue by the cooling means is prepared in bracket, a stator winding has the coil end which extends from the end face of a stator core to the method of outside, and even if there are few coil ends, the shielding material is formed so that inner skin may be covered. Therefore, a wind noise can be reduced, while being able to constitute the cooling ventilation flue in a generator smoothly and improving cooling nature of a stator winding.

[0061] Moreover, as for the shielding material, the hole is formed in the principal plane. Therefore, while refrigeration capacity improves, a shielding material can be fixed firmly.

[0062] Moreover, as for the shielding material, irregularity is formed in the front face. Therefore, while refrigeration capacity improves, a shielding material can be fixed firmly.

[0063] Moreover, the wrap shielding material has fixed the coil end with the 2nd thermally conductive good resin from a coil and the 1st resin which is alike and is already kicked. Therefore, heat can be transmitted to a shielding material good from a stator winding, and heat can be effectively radiated in generation of heat of a stator winding.

[0064] Moreover, in the coil end of one [ at least ] edge of a stator, the turn section over the predetermined pitch \*\*\*\*\* slot of a stator winding is formed in the hoop direction at the abbreviation same configuration.

Therefore, the irregularity of the hoop direction of the turn section decreases and it excels in space efficiency, and leakage inductance is equal, the stable output is obtained, generation of heat is still more nearly equal, temperature becomes uniform, and the temperature of a stator winding falls.

[0065] moreover, the space between the turn sections which adjoin the hoop direction formed of the coil of one [ at least ] edge of a stator, and the turn section over [ it is alike, set and ] the predetermined pitch \*\*\*\*\* slot of

a stator winding -- abbreviation -- it is formed identically. Therefore, while a cooling wind ventilates to homogeneity and cooling nature improves, a draft resistance is equalized by the hoop direction and a wind noise is reduced.

[0066] Moreover, the cross-section configuration within the slot of the conductor of a stator winding is an abbreviation rectangle configuration where the slot configuration was met. Therefore, the space factor within a slot is raised and an output and effectiveness improve. Moreover, the touch area of a strand and a stator core becomes large, thermal conductivity is raised, and the temperature of a stator winding falls further. Moreover, migration of the strand within a slot is prevented and breakage on an insulating coat is controlled.

[0067] Furthermore, the cooling lee-side style side of a cooling means is adjoined, and at least one side of a coil end is allotted. Therefore, a stator winding can be cooled efficiently.

---

[Translation done.]

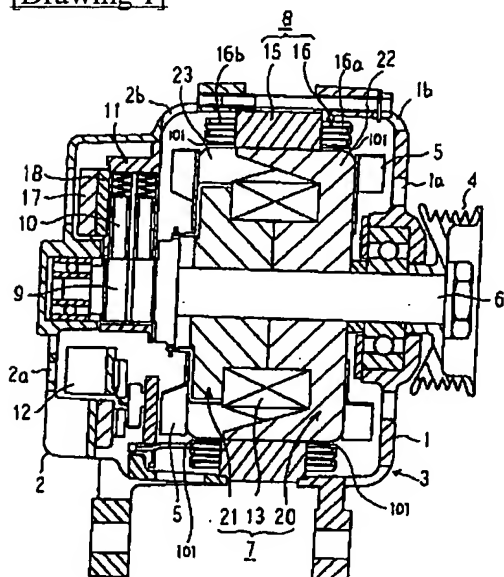
## \* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

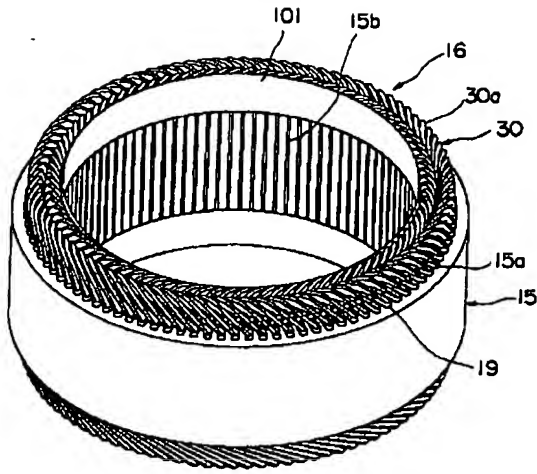
## DRAWINGS

[Drawing 1]



- |                |                      |
|----------------|----------------------|
| 1 : フロントブラケット  | 16 : 多相固定子巻線 (巻線コイル) |
| 2 : リヤブラケット    | 16a : フロント側の         |
| 7 : 回転子        | コイルエンド群 (コイルエンド)     |
| 8 : 固定子        | 16b : リヤ側の           |
| 15 : 固定子鉄心     | コイルエンド群 (コイルエンド)     |
| 5 : ファン (冷却手段) | 22, 23 : 爪状磁極        |

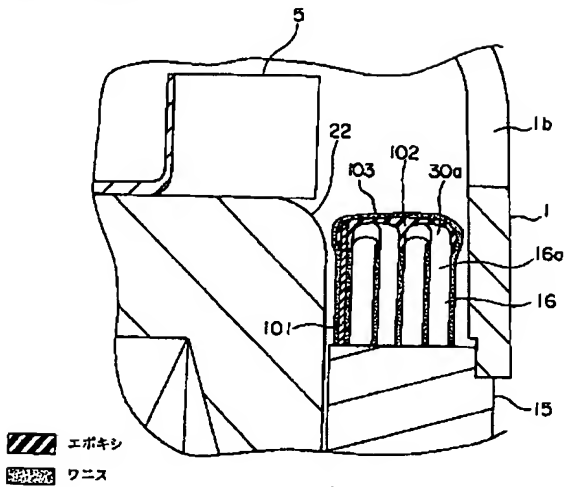
[Drawing 2]



30a: ターン部

101: 遮蔽板

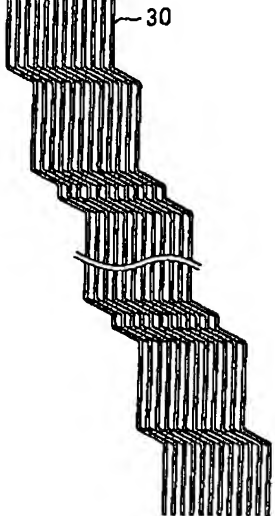
[Drawing 3]



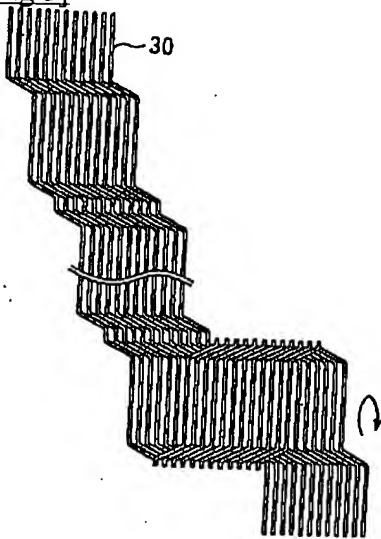
102: エポキシ (第1の視図)

103: ワニス (第2の視図)

[Drawing 4]



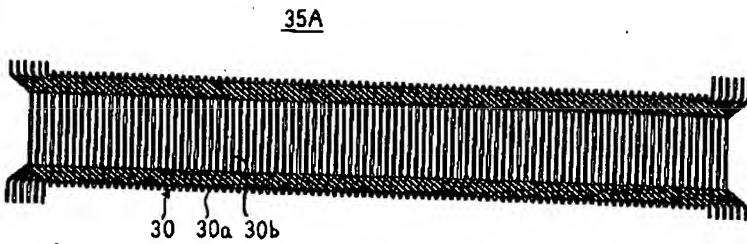
[Drawing 5]



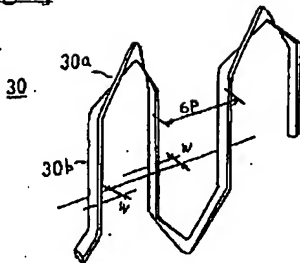
[Drawing 6]

(a)

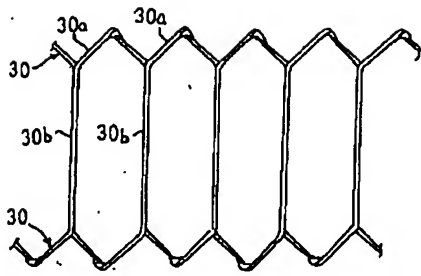
(b)



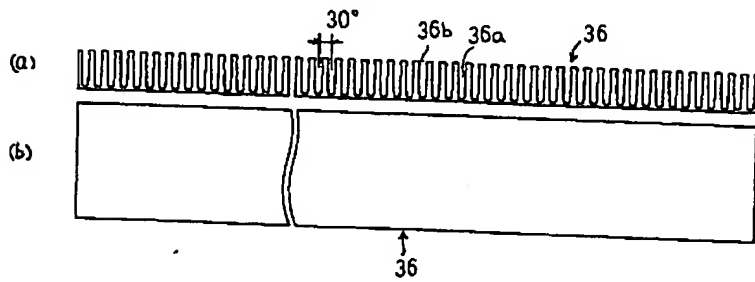
[Drawing 7]



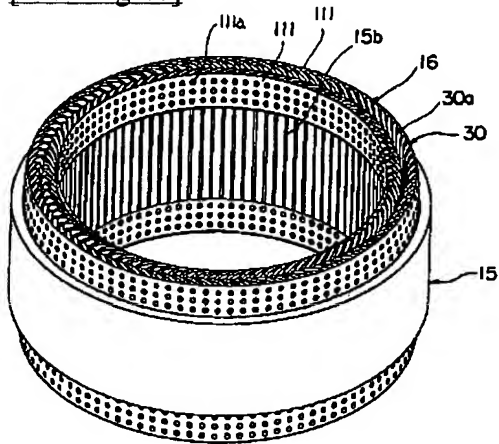
[Drawing 8]



[Drawing 9]

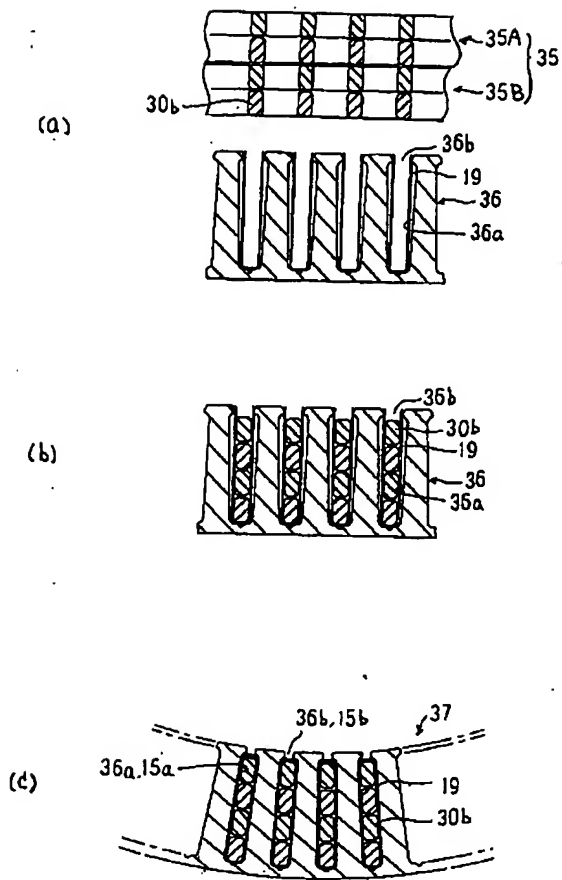


[Drawing 11]

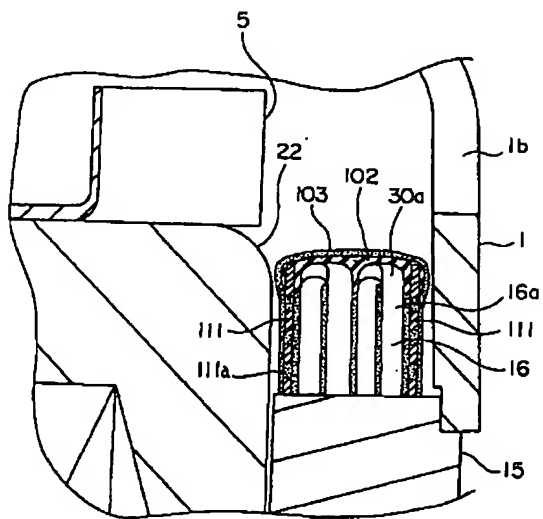


111: 透氣板  
111a: 孔

[Drawing 10]

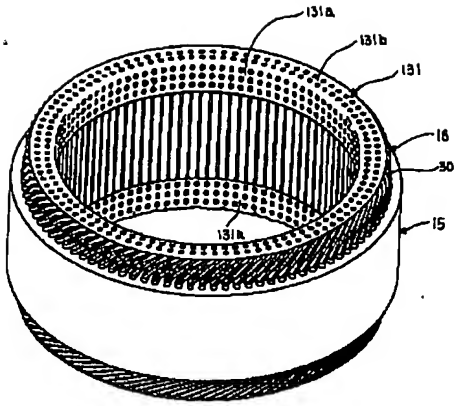


[Drawing 12]

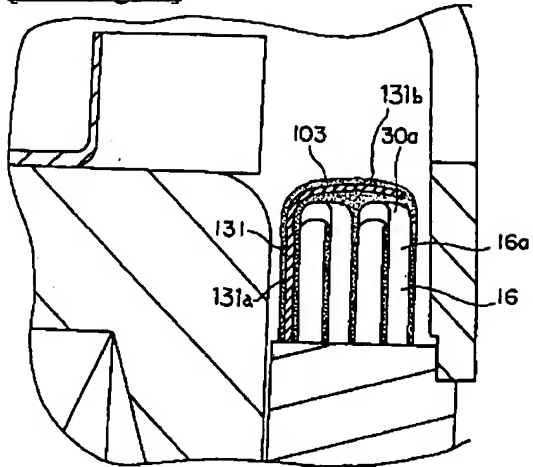


[Drawing 13]



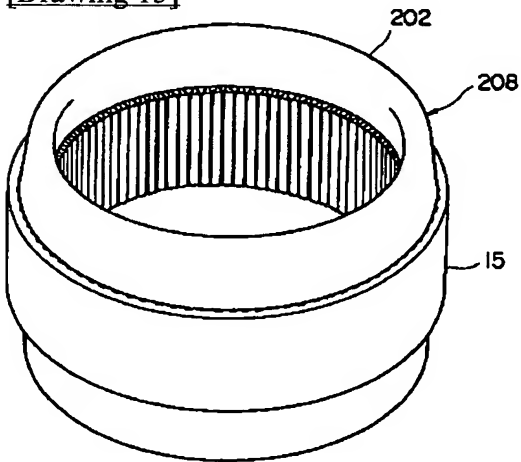


[Drawing 14]



131: 遮蔽板

[Drawing 15]



[Translation done.]